PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project	
Evaluate Fall Chinook Natural Production and Spawning Habitat Conditions in the Tucannon River	
BPA project number	**20024**
Contract renewal date (mm/yyyy)	
Multiple actions? (indicate Yes or No)	
Business name of agency, institution or organization requesting funding	
Washington Department of Fish and Wildlife	
Business acronym (if appropriate)	WDFW
Proposal contact person or principal investigator:	
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NPPC Program Measure Number(s) which this project addresses	
4.1A-3, 7.2, 7.4A.1, 7.5B.1, 7.5B.2, 7.5B.3, 7.6B.3	
FWS/NMFS Biological Opinion Number(s) which this project addresses	
4.1.d, 4.3-4.8	
Other planning document references	
Lower Snake River Compensation Plan **Wy-Kan-Ush-Mi Wa-Kish-Wit - Volumes I and II** **Snake River Salmon Recovery Team: Final Recommendations to NMFS** **State of Washington's and Western Washington Treaty Tribes Wild Salmonid Policy**	
Short description	
Assess fall chinook natural production and the potential for hatchery supplementation. Document sedimentation of fall chinook redds and estimate survival of eggs within redds. Capture, identify, enumerate and calculate survivals for migrating sub-yearling fall chinook. Identify origin of spawning adults through DNA and scale pattern analysis.	
Target species	
Snake River Fall Chinook Salmon	

Section 2. Sorting and evaluation

Subbasin
Lower Snake River - Tucannon River Subbasin

Evaluation Process Sort

CBFWA caucus		**CBFWA eval. process**		**ISRP project type**	
X one or more caucus		If your project fits either of these processes, X one or both		X one or more categories	
X	Anadromous fish	X	Multi-year (milestone-based evaluation)		Watershed councils/model watersheds
	Resident Fish	X	Watershed project eval.		Information dissemination
	Wildlife				Operation & maintenance
					New construction
				X	Research & monitoring
					Implementation & mgmt
					Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	**Project title/description**

Other dependent or critically-related projects

Project #	**Project title/description**	**Nature of relationship**
9401806	Tucannon River model watershed program	Provide a habitat assessment baseline
9401807	Pataha Creek model watershed program	Provide a habitat assessment baseline
9801003	Monitor and evaluate the spawning distribution of Snake River fall chinook.	Cooperative effort between agencies to document Snake River fall chinook spawning.
9102900	Life History and Survival of fall chinook salmon in the Columbia River	Life history and survival estimates from outside the Snake River Basin.

	Basin.	

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Determine the fate of fall chinook redds, eggs and alevins.	1a	Conduct weekly spawning ground surveys, identify and mark location of all redds.
		1b	Periodically monitor redd condition (evidence of scouring and deposition) through the fall, winter and spring as water conditions allow.
		1c	Collect fall chinook salmon eggs from the brood stock at Lyons Ferry Hatchery and incubate eggs to the eyed stage
		1d	Create 10 artificial redds, place about 1,000 eyed eggs in egg baskets, in each artificial redd.
		1e	Create 10 artificial redds with no eggs above and below Pataha Creek to document sedimentation of redds above and below known source of sediment input.
		1f	Cap all artificial redds and 3-5 natural redds.
		1g	Estimate egg to hatch success of artificial redds by digging up egg basket and counting the number of unhatched eggs.
		1h	Estimate alevin success by dividing the number of alevins collected by known or estimated eggs in each redd.
2	Determine the presence of and estimate annual production of juvenile fall chinook smolts leaving	2a	Operate fish trap, capture, identify, enumerate, PIT tag (1,000), CWT (3,500) and adipose fin clip fall

Obj 1,2,3	Objective	Task a,b,c	Task
	the river.		chinook salmon smolts.
		2b	Genetically sample (DNA - caudal fin clip) a portion of naturally produced chinook smolt to determine origin (spring or fall chinook)
		2c	Associate physical characteristics with migration time to assist in origin identification.
		2d	Collect and compare scale samples to distinguish between fall and spring chinook to facilitate identification of fall chinook and develop a scale baseline for later use.
		2e	Mark and release a known number of fall chinook upstream of the trap for recapture to calibrate trap efficiency.
		2f	Estimate the number of fall chinook smolts annually leaving the river.
3	Evaluate juvenile fish out migrant and adult return success rates.	3a	Collect information on PIT tagged juveniles during downstream migration and returning adult chinook interrogated at the Snake and Columbia River dams.
		3b	Collect and summarize CWT information on returning adult chinook recovered in fisheries, hatcheries and spawning ground survey recoveries.
		3c	Estimate smolt to adult survival rates based on CWT recoveries.
4	Identify in- river factors that may limit fall chinook production.	4a	Monitor daily river flow and temperatures throughout the year via USGS flow measurements and WDFW temperature recorders in the lower Tucannon River.
		4b	Record water turbidity at the smolt trap on a daily basis, and at points above and below Pataha Creek.
		4c	Monitor siltation, gravel deposition and/or scouring effects on both artificial (with and without eggs) and natural redds during the spawning and incubation period using freeze core and/or scour chain methods.

Obj 1,2,3	Objective	Task a,b,c	Task
5	Determine annual egg to smolt survival rate of juvenile fall chinook from the Tucannon River relative to river conditions from egg deposition to out-migrant.	5a	Estimate the total number of eggs in the river by multiplying the total number of redds above the smolt trap times average fecundity.
		5b	Estimate annual egg to smolt success by dividing the estimate of annual smolt production determined from Objective 2, by the number of eggs deposited in the river above the smolt trap.
6	Determine through DNA and scale pattern analysis , if fall chinook adults found in the Tucannon River are of Snake River origin.	6a	Collect scales from spawned out adults in the Tucannon River and determine wild or hatchery origin based on scale patterns
		6b	Have scale patterns analyzed against other fall chinook populations (Lyons Ferry and Priest Rapids Hatchery, Hanford Reach wild stock, Umatilla and Klickitat Hatchery, and wild origin Snake River fall chinook.
		6c	Collect DNA fin clips from spawned out carcasses recovered in the Tucannon River. Collect fin clips from know origin spawners at Lyons Ferry and Umatilla hatcheries
		6b	Analyze DNA from adults and juveniles to determine relations
7	Information exchange.	7a	Disseminate the information collected (oral and written) and provide recommendations for management implementation.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measurable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999-2003	05/2000-2004	H_o: Fall chinook redds and eggs do not survive in the Tucannon River	X	25
2	03/2000-2004	06/2000-2004	Origin of fall chinook juveniles (if captured) will be determined.	X	25

Obj #	Start date mm/yyyy	End date mm/yyyy	Measurable biological objective(s)	Milestone	FY2000 Cost %
3	03/2000-2004	10/2000-2004	H_o: Juvenile fall chinook will return as adults.	X	10
4	10/1999-	6/2004			15
5	10/2000-2004	10/2000-2004			3
6	10/1999-2004	12/1999-2004	H_o: Spawning fall chinook in the lower Tucannon River represent Snake River Stock.	X	15
7	10/1999	9/2000			7

Schedule constraints

During some years, extreme river flows may preclude successful spawning ground surveys and proposed monitoring of those redds over time. In addition, high spring runoff may hinder our attempts to cap redds and trap juvenile migrants. Until we formally request a Section 10 Permit modification, NMFS may prevent us from capping or disturbing natural fall chinook redds in the Tucannon River, as eggs within each redd are listed as "threatened" under the ESA. If our permit modification is rejected, results from artificial redds (created as natural as possible without using egg baskets) will have to be utilized. Even then, redd capping efforts may be futile against heavy spring runoffs. Because this project is not scheduled to begin until 2000, WDFW has time to request any changes in our research permit.

Completion date

Year 2004. This project is expected to require 5 years (2000-2004), and then possibly continue intermittently thereafter to monitor changes in spawning habitat and redd success. Yearly findings will be made, however, it will take multiple years of sampling to cover a range of flow and sediment conditions.

Section 5. Budget

FY99 project budget (BPA obligated):	$

FY2000 budget by line item

Item	Note	% of total	FY2000 ($)

Personnel	Three technician 2's (one 3 months, two 4 months each), One Biologist 3 (4 months) and one full time Graduate student	44.0	53,100
Fringe benefits	28.5% for state WDFW employees and 1.0% for graduate student.	9.5	11,470
Supplies, materials, non-expendable property	Freeze core sampler, turbidimeter, material to build redd caps, genetic analysis (juvenile and adult), CWT machine rental ($2,200/month)	18.2	21,900
Operations & maintenance	vehicle and smolt trap maintenance	1.2	1,500
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	None		0
NEPA costs	None	0	0
Construction-related support	None	0	0
PIT tags	# of tags: 1,300	3.1	3,770
Travel	Vehicle leasing at 250/month and 1000 miles/month x $0.31 x 6 months	2.8	3,360
Indirect costs	Washington State overhead at 22.5% Graduate Student overhead at 31.5%	21.2	25,587
Subcontractor	None		0
Other	None		0
TOTAL BPA REQUESTED BUDGET			120,687

Cost sharing

Organization	**Item or service provided**	**% total project cost (incl. BPA)**	**Amount ($)**
LSRCP	smolt trap, computers, office space, phone, PIT tag equipment, additional personnel time, travel and vehicle operation and maintenance	25.5	45,000
Columbia Garfield County Conservation Districts (Tucannon and Pataha Model Watersheds)	Temperature recorders (5), ISCO sediment samplers (3)	6.2	11,000
Total project cost (including BPA portion)			176,687

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$112,000	$114,500	$116,500	$118,000

Section 6. References

Watershed?	Reference
	Bugert, R., P. LaRiviere, D. Marbach, S. Martin, L. Ross, and D. Geist. 1990. Lower Snake River Compensation Plan Salmon Hatchery Evaluation Program: 1989 Annual Report. U.S. Fish and Wildlife Service, LSRCP Office, Boise, ID.
X	Chevalier, B., C. Carson, and W.J. Miller 1984. Report of engineering and biological literature pertaining to the aquatic environment: special emphasis on dissolved oxygen and sediment effects on salmonid habitat. Colorado State University, Department of Agriculture and Chemical Engineering. ARS Project #5602-20813-008A. Fort Collins, CO.
	Gustafson-Marjanen, K. I., and J. R. Moring. 1984. Construction of artificial redds for evaluating survival of Atlantic salmon eggs and alevins. North American Journal of Fisheries Management 4:455.
	Kelly, D.W., and Associates. 1982. Ecological investigations on the Tucannon River Washington. Newcastle, CA.
	Lotspeich, F. B., and F. H. Everest. 1981. A new method for reporting and interpreting textural composition of spawning gravel. U.S. Forest Service Research Note PNW-369.
	Mendel G., J. Bumgarner, D. Milks, L. Ross and J. Dedloff 1996. Lyons Ferry Hatchery Evaluation: Fall Chinook. Fall Chinook salmon 1995 annual report #H96-09 to U.S. Fish and Wildlife Service, Boise, ID.
	Nawa, R. K.; and C.A. Frissel. 1993. Measuring scour and fill of gravel steambeds with scour chains and sliding-bead monitors. North American Journal of Fisheries Management. 13 (3): 634-639.
	Phillips, R.W., and K. V. Koski. 1969. A fry trap method for estimating salmonid survival from egg deposition to fry emergence. Journal of Fisheries Research Board of Canada. 26: 133-141.
	Platts, W. S., M. A. Shirazi, and D. H. Lewis. 1979. Sediment particle sizes used by salmon for spawning, with methods for evaluation. U.S. Environmental Protection Agency, EPA Report 600/3-79-043, Washington, DC.
	Snake River Salmon Recovery Team. 1994 Final recommendation to National Marine Fisheries Service, Portland, OR.
X	USACE (U.S. Army corps of Engineers), 1975. Special Report: Lower Snake River Fish and Wildlife Compensation Plan. Walla Walla, WA.
	Washington Fish and Wildlife Commission. 1997. Policy of Washington Department of Fish and Wildlife and Western Washington Treaty Tribes Concerning Wild Salmonids. Olympia, WA.
	Waters, T.F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society Monograph 7, American Fisheries Society,

	Bethesda, MD.
	Wy-Kan-Ush-Mi Wa-Kish-Wit. 1995a. The Columbia River Anadromous fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakima Tribes, Volume I, Portland, OR.
	Wy-Kan-Ush-Mi Wa-Kish-Wit. 1995b. The Columbia River Anadromous fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs and Yakima Tribes, Volume II - Subbasin Plans, Portland, OR.

PART II - NARRATIVE

Section 7. Abstract

Presently, the WDFW does not know if fall chinook salmon spawning in the lower Tucannon River represent a self-sustaining population, even though they are listed as "threatened" under the Endangered Species Act (ESA). Future hatchery supplementation of fall chinook (500,000 subyearlings) has been called for in the Tucannon River (Wy-Kan-Ush-Mi Wa-Kish-Wit 1995b), but river conditions (severe turbidity, channel instability, and high substrate sedimentation) may limit natural production of fall chinook in the river.

The proposed project will attempt to identify which in-river factors are limiting natural production, and determine the origin of current spawners and their success. Project objectives are designed to gather presently unknown information on the presence, genetic origin, abundance and fate of fall chinook redds, eggs, alevins and smolts, and to identify which factors are limiting population survival. The results of this study will be used as partial assessment and baseline for the Model Watershed Programs (1992 NPPC) in the basin, and as baseline information for determining if future Lower Snake River Compensation Plan (1975 USACE) hatchery supplementation could address the Columbia Basin Fish and Wildlife Program (1994 NPPC) attempt to encourage rebuilding a naturally produced population of fall chinook. Specific findings will be used to develop scientifically supported programs to supplement naturally spawning populations, and to balance hatchery releases with the capacity of the natural environment. The project is proposed for 2000-2004. Detailed reports of results and recommendations will be provided.

Section 8. Project description

a. Technical and/or scientific background

Since 1987, the WDFW has documented 16-61 fall chinook salmon redds per year in the lower (21 Km) Tucannon River. Most recovered spawned out salmon carcasses were unmarked, and therefore were of unknown origin. Fall chinook from outside the Snake River Basin (example: Umatilla and Klickitat hatchery fall chinook) are known to stray into the Snake River Basin in relatively large numbers (Mendel et al 1996). Many of these stray fall chinook are unmarked, and could represent a large proportion of the fish spawning in the Tucannon River. WDFW has also recovered a few spawned out fish in the Tucannon River that originated from Lyons Ferry or Umatilla hatcheries. WDFW is unsure whether spawning fall chinook in the lower Tucannon River represent a self sustaining population, or represent a conglomeration of many stocks from

other basins and hatcheries. However, once these fish spawn in the river, progeny that survive become listed as “threatened” under the Endangered Species Act (ESA), unless the progeny can be genetically determined to be non-Snake River origin fish. Therefore, WDFW has the obligation to protect this listed species and improve their critical habitat to the fullest extent possible.

Habitat conditions in the lower Tucannon River and its tributaries (Pataha Creek, Kellog Creek) have been heavily degraded by past agricultural and grazing practices. These practices have led to increased sediment loads (fine silt and mud) during the wetter months, typically during and after when fall chinook are spawning. A modeling study (Chevalier et al. 1984) determined that reductions of sediment in the Tucannon River will be necessary to restore the aquatic habitat for salmonid spawning. Siltation of river bottoms and eventual smothering or entrapment of salmon eggs and alevins in redds has been well documented (Waters 1995). Based on the literature, WDFW believes severe turbidity following rain and high water events, channel instability, and subsequent high sedimentation of the substrate are the primary factors limiting natural production of fall chinook salmon in the lower Tucannon River. Other limiting factors such as the amount of spawning area and appropriate gravel sizes are not considered a problem, nor is the amount of invertebrate production for rearing juveniles. (Bugert el al. 1990, Kelly and Associates 1982).

Juvenile fall chinook production (abundance) from the Tucannon River has not been well documented and is currently unknown. Determining the abundance and reproductive potential of fall chinook salmon in the Tucannon River will require additional personnel, which cannot currently be met under our LSRCP smolt monitoring operations. Personnel and equipment costs will therefore be shared with LSRCP evaluation and Model Watershed programs to gather information on fall chinook and habitat conditions in the Tucannon River.

b. Rationale and significance to Regional Programs

The proposed project will partially satisfy measures in the NPPC's Fish and Wildlife Program. This proposal will be used in assessing the success of the existing Model Watershed Programs in the Tucannon and Pataha river basins by providing baseline information on spawning conditions and success, as well as measuring changes as habitat improvements are implemented. As part of the assessment of the Model Watershed Programs in the basin (4.1A-3), and as baseline information for determining future supplementation (7.4A.1), this study could address the measures listed under 7.2 of the Council's Plan. This includes evaluating future adjustments to the Lyons Ferry Hatchery program to facilitate rebuilding a naturally produced population of fall chinook by using scientifically supported programs to supplement weak wild and naturally spawning fish populations (7.2, 7.6B.3), and to balance hatchery releases with the capacity of the natural environment. In addition, the NPPC Fish and Wildlife Plan for Snake River fall chinook salmon calls for “implementing supplementation” (7.5B.1, 7.5B.2) and to continue funding basic life history studies that identify limiting factors (7.5B.3), and the effects of flow and stream temperatures on spawning and rearing habitat.

This project is consistent with goals set forth in the tribal recovery plan (Wy-Kan-Ush-Mi Wa-Kish-Wit 1995a). By attempting to identify limiting factors on fall chinook production in the

Tucannon River, and suggesting solutions to improve it, WDFW will provide the first step toward restoring fish in their historical location, emphasizing strategies that rely on natural production, and promoting a healthy river system.

Under NMFS Proposed Recovery Plan, this study will provide information needed to develop and implement a management plan for Snake River fall chinook salmon gene banking and conservation, particularly regarding hatchery supplementation in the Tucannon and Snake rivers. Further, this study will provide baseline information for a potential future hatchery supplementation program. The project will assist with optimizing hatchery production of fall chinook salmon in the Snake River Basin while conserving natural populations. This would be the first step of assessing the potential for success of fall chinook supplementation in the lower Tucannon River.

Recommended actions from the Snake River Recovery Team (1994) include protection and improved spawning and rearing habitat for all Snake River chinook stocks. Further, the Team recommended assessing the quality of spawning habitats and identifying of the most severe bottlenecks impeding productivity. In addition, the State of Washington's Wild Salmonid Policy call for habitat protection and restoration that will provide water and sediment of a quality that will support productive, harvestable, wild salmonid populations. This project will provide that baseline information and quantify juvenile production from a naturally spawning population of threatened Snake River fall chinook salmon in designated critical habitat. WDFW will determine if the Tucannon River is a production area for Snake River origin fall chinook salmon and whether the Tucannon River provides suitable "critical" habitat.

c. Relationships to other projects

This study will enable WDFW to evaluate the potential for supplementing the Tucannon fall chinook population from Lyons Ferry Hatchery under the Lower Snake River Compensation Plan. Supplementation in the form of releasing 500,000 subyearling chinook salmon into the lower Tucannon River has been proposed as part of US v Oregon discussions by the Production Advisory Committee, and listed in the Tribal Recovery Plan - Volume 2. However, until limiting factors and natural production success are determined, a supplementation program for fall chinook in the Tucannon River would be potentially wasteful.

The proposed study should be funded for FY2000 to facilitate coordination with related data collection for on-going LSRCP studies of spring chinook and steelhead, and because it is consistent with, and necessary for, the proposed Recovery Plan and the NPPC's Fish and Wildlife Program. In addition, this study is consistent with other Washington State funded efforts (Watershed Restoration HB2496) in the basin. This study will also provide a habitat assessment baseline that would be valuable for evaluating model watershed programs (Tucannon River and Pataha Creek, project numbers 9401806 and 9401807) that are being implemented in the Tucannon River Basin. Model Watershed Programs for the Tucannon River and Pataha Creek will benefit from this project as quantitative data will be obtained regarding sedimentation and fall

chinook production problems in the lower Tucannon River. Recommended solutions can then be made. This proposed project has been reviewed and is supported by both conservation districts (Columbia County - Terry Bruegman pers comm., Garfield County - Duane Bartels pers comm.) who administer the Model Watershed program from each stream. Delayed funding for this project will reduce our effectiveness in monitoring and evaluating the model watershed programs and in addressing the feasibility of increasing this population through a combination of habitat improvements and hatchery supplementation.

Data collected from this study will be partially linked with two other projects regarding fall chinook in the Columbia and Snake River basins. Life history and survival data collected from this study will correlate with Project # 9102900 (Life history and survival of fall chinook salmon in the Columbia River basin), and provide data of fall chinook life history in two different river basins with different conditions. Data collected from this proposed project may provide additional data to supplement Project #9801003 (Fall chinook spawning distributions in the Snake River basin). Fall chinook released from upstream acclimation facilities on the Snake River (Big Canyon, Pittsburg Landing, and Captain John) may stray and spawn in the Tucannon River.

d. Project history

None

e. Proposal objectives

The goal of this proposed research is to determine the likelihood of success if fall chinook salmon supplementation plans in the Tucannon River are implemented. This research would potentially save hundreds of thousands of dollars that would be needed for implementation of a hatchery supplementation program. If supplementation is feasible, it will also identify areas of the Tucannon River where supplementation would likely succeed. Seven main objectives were identified: 1) determine the fate of fall chinook redds, eggs and alevins; 2) determine the presence of, and estimate annual production of, juvenile fall chinook smolts leaving the river; 3) determine juvenile fish out migrant and adult return success rates; 4) identify in-river factors that may limit fall chinook production; 5) estimate annual egg to smolt survival rate of juvenile fall chinook from the Tucannon River relative to river conditions from egg deposition to smolt 6) Determine through DNA and scale pattern analysis or rare earth elemental analysis, if fall chinook adults found in the Tucannon River are of Snake River origin and 7) disseminate the information collected and provide recommendations for management implementation. Null hypotheses and assumptions to complete the objectives are listed below.

Objective #1 - Determine fate of fall chinook redds, eggs and alevins.

H_o: Fall chinook redds (eggs and alevins) are not impacted by channel scouring or sediment deposition events.
H_o: Eggs and alevins survive the turbidity and siltation of the lower Tucannon River..

Assumptions: WDFW assumes that it will be able to monitor redd condition over many months and under varied river conditions. Surface scouring of a redd may not indicate success or failure

of a redd. Capping the entire natural redd may be difficult (size related), and may skew results. Whether or not WDFW will be allowed to cap and evaluate survival in natural redds may largely determine our results. Artificial redds may survive better or worse depending on their location in the river and how they are constructed, but it may also be difficult to cap. If successful, we will have to assume they perform similar to natural redds.

Objective #2 - Determine the presence of, and estimate annual production of, juvenile fall chinook smolts leaving the river.

H_o: Naturally produced sub-yearling fall chinook smolts will be distinguishable from naturally produced yearling spring chinook smolts.

Assumptions: WDFW assumes that it will be able to eventually identify (genetically, morphologically , age determination, out-migrant timing) between spring and fall chinook salmon smolts in the Tucannon River. Sub-yearling fall chinook smolts will be captured, marked, and recaptured at high enough rates to make reliable migrant population estimates. Operation of the smolt trap for continuous periods will be critical to capture enough fish for a reliable population estimate. High water events and heavy debris which can disable the trap may limit our evaluation efforts.

Objective #3 - Determine juvenile fish out migrant and adult return success rates.

H_o: Fall chinook that are tagged at the smolt trap will return as adults.

Assumptions: Sub-yearling fall chinook will be large enough in length to successfully PIT and CWT tag for juvenile and adult evaluation. The number of subyearling fall chinook captured at the smolt trap will be adequate for tag (PIT and CWT) group sizes. PIT tagged salmon (assuming fall chinook) will be interrogated at Columbia and Snake River dams in adequate number to evaluate migration success and to document downstream migrant timing in relation to water budget flows. CWT sub-yearling fall chinook salmon will be recovered in fisheries, hatcheries or on spawning ground surveys in large enough numbers to calculate smolt to adult survival rates.

Objective #4 - Identify in-river factors that may limit fall chinook production.

H_o: None identified

Assumptions: WDFW will be able to freeze core the artificial redds, and scour chains will be successfully tracked. High water events may completely remove or bury scour chains to allow full evaluation. Other artificial redds (containing no eggs) may also be constructed so no loss in eggs would occur, but siltation levels could still be measured.

Objective #5 - Estimate annual egg-to-smolt survival rate of juvenile fall chinook from the Tucannon River and correlate to measured river and redd habitat conditions.

Assumptions: Silt deposition in artificial and natural redds will be the same and will represent

overall conditions in the river. Estimated fecundity for fish constructing natural redds (based on fecundity estimate at Lyons Ferry Hatchery fall chinook salmon) and smolt trap migrant estimates are accurate.

Objective #6 - Determine through DNA, scale pattern and/or rare earth elemental analysis, if fall chinook adults found in the Tucannon River are of Snake River origin.

H_o: Fall chinook adults in the Tucannon River represent a unique isolated spawning population.

Assumptions: Freshwater scale patterns from each sample location will show unique scale patterns for stock separation. Adequate number of readable scales will be collected from each location. Genetic analysis will be able to determine with accuracy the presence or absence of multiple stocks of fish.

Objective #7 - Disseminate the information collected and provide recommendations for management implementation.

WDFW will report the findings of this study in quarterly and annual reports to BPA, annual publications for the LSRCP, and, if possible, in a refereed journal. Oral presentations will be made at regional watershed meetings and American Fisheries Society meetings. Results will be incorporated into the Tucannon River Model Watershed Projects' decision making process, and planning documents for supplementation activities in the Tucannon River basin.

f. Methods

Redd success and habitat conditions will be assessed with a combination of monitoring artificial and natural redds, redd capping, scour chains and freeze core sampling (objectives #1 and #4). All redds will be initially marked with flagging on trees. Depending on water conditions, crews will later return to mark the perimeter of all redds with painted rocks, large enough to withstand moderate river flows. Observations of multiple redds through the fall, winter and spring will occur. Also, ½ inch re-bar stakes will be placed with each redd to monitor scour, and, scour chains (Nawa and Frissell 1993) will be placed in close proximity to a sample of these redds for further evidence of scouring and channel instability. Any scouring or redd disturbance will be recorded. Success of monitoring the redds over time will largely depend on river flows.

Artificial redds (objective #1) will be constructed following the techniques described by Gustafson-Marjanen and Moring (1984). A total of 1,000 hand counted eyed eggs will be placed in each artificial redd (10,000 total from Lyons Ferry Hatchery fall chinook program). Gravel sizes to cover the egg will vary in size and represent gravel sizes located in the section of the river. Cleaning screens will be used to remove all fine particles (<2 mm in diameter). Artificial redds will be located above and below a known point of sediment input (Pataha Creek) for direct comparison of silt accumulation, and also located near natural redds for comparison if allowed by NMFS. If redd capping is not possible, or eggs are not available from Lyons Ferry Hatchery, then artificial redds will be constructed without eggs, and freeze core samples will be collected to measure: 1) percent fines <8mm, 2) geometric mean of particle size (Platts et al. 1979) and 3) to calculate a fredle index (Lotspeich and Everest 1981). All three measurements provide reliable

predictors of egg survival.

Redd caps (objective #1) will be constructed with appropriate materials to withstand moderate flow regimes, and to ensure safe collection of alevins. Design of redd caps has not been fully determined, but will follow design criteria described by Phillips and Koski (1969). Redd caps will be checked every one to three days depending on river flows and time of year (i.e. are alevins actively exiting the redd). After alevin stop emerging from the redds, all artificial redds will be freeze core (objective #4) sampled or completely dug up. Fine sediment accumulation within each redd will be measured, and the total number of dead eggs will be counted. Egg to hatching alevin survival rates will be calculated for each redd (objective #1). Identical procedures will be used on natural redds if allowed by NMFS. Redd caps will only be successful if river flows stay within reasonable levels, and we are physically able to sample the caps. Materials to make the redd caps will likely withstand moderate flow conditions. Redds caps will also be visible to fisherman and local landowners who may not understand the importance of the caps. WDFW will inform area fisherman and residents of the research being conducted.

In conjunction with our LSRCP study of spring chinook (Bumgarner et al, 1998) and steelhead, WDFW will operate a juvenile migrant trap in the lower Tucannon River (rkm 3) to capture and enumerate sub-yearling chinook salmon (objective #2). Fish will be captured using a five-foot rotary screw trap. A portion of the fish will be fin clipped for DNA analysis to differentiate between spring chinook salmon, and for subsequent release above the trap for trap efficiency tests. Morphological differences, migration timing and scale samples will also be used to determine origin. Results of the trap efficiency tests will be used to estimate the total outmigration (objective #5). Up to 1,300 of the fall chinook captured (>60mm) will be PIT tagged to monitor their success and migration timing out of the Snake and Columbia rivers, and possible adult return information given adequate survival rates (objective #3). If possible, all subyearling fall chinook captured (>50mm) will be adipose clipped and given a CWT for adult return information (objective #3).

River conditions (flow, temperature and turbidity) will be monitored throughout the year (objective #4). Flow data will be obtained from the USGS gauge station located at rkm 9 on the Tucannon River. Turbidity (NTU) measurements (at points above and below Pataha Creek) will be collected daily when the smolt trap is operating, and intermittently when the trap is not running (typically during the late fall and winter due to ice). The Model Watershed programs will provide data from three ISCO water samplers (one in Pataha Creek, one in the Tucannon River above Pataha Creek, and one about seven kilometers below Pataha Creek). Rain or snow events that may change the turbidity of the Tucannon River or Pataha Creek will be monitored and turbidity measurements will be made. Turbidity units will be summed daily for the time when eggs and alevins are in the redds, and will be correlated with silt deposition and mortality rates measured in other identified tasks.

Scales and fin clips (DNA analysis) and CWT's will be collected from unmarked recovered carcasses found on the Tucannon River (objective #6). Additional scales and DNA samples will be collected (in cooperation with others) from surrounding hatcheries (Umatilla and Priest Rapids) and other natural spawning ground areas (Hanford Reach). Coded-wire tags from other hatcheries, fisheries, or from carcasses recovered on spawning ground surveys will be reported to

and extracted from the Pacific States Marine Fisheries Commission (PSMFC) CWT database. Freshwater scale patterns of fish recovered in the Tucannon River will be compared to other collections for possible matches, or to determine if unmarked spawners in the Tucannon River are of hatchery origin. Scales from adults may also be subjected to rare earth elemental analysis to determine origin. DNA samples from the various adult collections will be compared, as well as juvenile collections to adult collections.

Information collected will be spread through a variety of coordination and informational meetings with the public, other agencies and co-managers, and local conservation districts so the data can be used for wise and informed habitat and harvest management decisions.

g. Facilities and equipment

Lyons Ferry Hatchery will supply approximately 10,000 eyed eggs for creating artificial redds in the Tucannon River. Lyons Ferry is located at rkm 95 on the Snake River, approximately 5 rkm from the mouth of the Tucannon River. Lyons Ferry currently produces 900,000 yearling and variable numbers of sub-yearling production fall chinook (Snake River stock) for release at Lyons Ferry and upstream (above Lower Granite Dam) acclimation sites. The Lyons Ferry fall chinook salmon stock has been identified as the only appropriate fall chinook stock to aid in the recovery of Snake River fall chinook salmon. Known Lyons Ferry origin eggs are therefore justified for use in the Tucannon River.

A fully functional juvenile fish trap is operated annually by WDFW on the Tucannon River under the research and monitoring program of the LSRCP for spring chinook and steelhead. Office space, vehicles and additional personnel help will be provided by WDFW at the Snake River Lab in Dayton. Field equipment such as the materials used to build redd caps, scour chains, freeze core sampler, screens to sift substrate from the core samples, and other minor field equipment and some office supplies will have to be purchased. A PIT tagging station is also available from the Snake River Lab in Dayton and a CWT machine will be rented or loaned from the WDFW, CWT lab in Olympia. Data from the ISCO water samplers and temperature recorders will be provided by the Tucannon and Pataha Model Watershed programs.

h. Budget

The total amount request for FY2000 is $120,687. Of that amount, approximately 75% of the first years budget is allotted for personnel, fringe benefits, and overhead. While WDFW currently operates the smolt trap with existing LSRCP funded personnel, capturing, sampling, and tagging fall chinook will require two additional people, and the trap will operate later in the spring than usual. One additional person will be needed to assist the graduate student in creating artificial redds and conducting additional spawning ground surveys to collect carcasses for genetic identification. Much of the equipment required (smolt trap, PIT tag station, other vehicles, office space and computer) to evaluate and accomplish identified tasks are in hand and will be used jointly with the WDFW LSRCP Lyons Ferry Evaluation Program. This overall cooperation greatly reduces the cost of this project. The cost of PIT tags, materials to build redd caps, a freeze core sampler (if allowed), turbidimeter, and genetic analysis will require approximately 18% of the first years annual budget. Equipment cost will be reduced following the first year

assuming redd caps and other purchased equipment are still functioning. Depending on debris loads during spring runoff, in season repairs will be needed on an annual basis.

Section 9. Key personnel

Personnel required to complete the listed tasks include partial time from three Scientific Technician II's, one Biologist III and a graduate student. Listed below is the resume for the lead administrative and biological coordinator for this project who will supervise the Scientific Technicians, and provide guidance to the graduate student.

Joseph D. Bumgarner - Principle Investigator

EDUCATION:

M.S. (Fisheries)	June, 1993 University of Washington, Seattle, WA	**G.P.A. 3.5**
B.S. (Fisheries)	December, 1987 University of Washington, Seattle, WA	**G.P.A. 3.5**

WORK HISTORY:

June, 1993 to present Washington Department of Fish and Wildlife, Dayton, WA

Fish Biologist II and III - Responsible for identifying, designing, conducting, analyzing, interpreting, and reporting appropriate research for Lower Snake River Compensation Plan (LSRCP) for spring chinook mitigation in southeast Washington. Relate findings to LSRCP and fish management needs in area rivers. Performs as the WDFW spring chinook specialist for the LSRCP program. Takes primary responsibility for the organization, writing and data analysis for annual Tucannon spring chinook salmon report. Assists in routine professional biological work related to spring and fall chinook salmon production and evaluation at Lyons Ferry Hatchery. Responsible for all smolt trapping operations and juvenile smolt estimates in the Tucannon River. Implementation of PIT tag technology for effective evaluation of spring and fall chinook from Lyons Ferry. Extracts CWT information from PSMFC CWT database for evaluation of adult returns from Lyons Ferry and Tucannon Hatchery programs.

PROJECT EXPERTISE:

Current duties include supervision of smolt trap operation and smolt population estimates in the Tucannon River. Expertise in PIT tagging fish, downloading interrogations from Columbia and Snake River dams. Extracting CWT data and estimating smolt to adult survival rates and parent to progeny ratios of Tucannon River spring chinook salmon. Familiar with DNA techniques to apply to this project. Ability to read scales for freshwater and saltwater residence times. Familiar through literature review of redd capping, scour chain, sediment sampling and freeze core sampling

RECENT REPORTS:

Bumgarner J.D. 1998. Washington's LSRCP Spring Chinook Program - Tucannon River. In::

Proceeding of the Lower Snake River Compensation Plan Status Review Symposium. Compiled by the U.S. Fish and Wildlife Service, Lower Snake River Compensation Plan Office, Boise, Idaho. September 1998. 276p.

Bumgarner, J., D. Milks, L. Ross, and M. Varney 1998. Tucannon River Spring Chinook Hatchery Evaluation. 1997 Annual Report, #H98-06 to U.S. Fish and Wildlife Service, Boise, ID.

Mendel G., J. Bumgarner, D. Milks, L. Ross and J. Dedloff 1996. Lyons Ferry Hatchery Evaluation: Fall Chinook. Fall Chinook salmon 1995 annual report #H96-09 to U.S. Fish and Wildlife Service, Boise, ID.

Section 10. Information/technology transfer

WDFW will report the findings of this study in quarterly and annual reports to BPA, annual publications for the LSRCP, and, if possible, as publications in a refereed journals. Oral presentations will be made at regional watershed meetings and American Fisheries Society meetings. Results will be incorporated into the Tucannon River Model Watershed Projects' decision making process, and planning documents for supplementation activities in the Tucannon River basin. Additional findings and summaries will be incorporated into the graduate students Masters or Doctoral Thesis.

Congratulations!